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Argonne National Laboratory Puts Alternative-Fuel Vehicles The Test

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Argonne National Laboratory supports alternative-fuel vehicles (AFVs) both in theory and in practice. As its scientists study new ways to power cars and trucks, Argonne's fleet is participating in an AFV test program.

AFVs are Integral Part of Fleet

Located near Chicago, Argonne is one of the U.S. Department of Energy's (DOE's) largest research and development centers. The 1,700-acre site comprises more than 60 buildings linked together by almost 40 miles of road. Its 4,500 scientists, engineers, and support staff perform research in (a) engineering; (b) basic sciences; and (c) energy, environmental, and biomedical sciences. The Technology Engineering Group is involved in testing AFVs, encouraging the design of AFVs, and developing cleaner-burning engines. To support these activities, Argonne maintains a fleet of 300 vehicles, including alternative-fuel vehicles (AFVs). Because of its role in automotive engineering research and experience in fleet management, Argonne was an ideal candidate for programs conducted under the Alternative Motor Fuel Act (AMFA) of 1988.

The Alternative Motor Fuel Act directs DOE to purchase original equipment manufacturer (OEM) AFVs, use them in the federal fleet, and collect data on their performance, fuel economy, and durability. Managed by DOE's National Renewable Energy Laboratory (NREL), this demonstration project analyzes fuel economy, performance, safety, maintenance, emissions, and costs of AFVs. The resulting information is available to the public as well as researchers.

Argonne's Center for Transportation Research maintains the largest demonstration center in the AMFA Program. Data collection focuses on vehicle driveability, reliability, and fuel efficiency, but other operational characteristics are also monitored, such as emissions and performance under varying weather conditions. The Laboratory became involved in 1992 when it leased five compressed natural gas (CNG) vans and three ethanol sedans. Today, Argonne operates 62 alternative-fueled sedans, vans, minivans, and pickup trucks. Seven gasoline-fueled vehicles are used as control vehicles for comparison studies.

The AFVs are an integral part of Argonne's fleet. Employees use the AFVs in their daily work, including material pickup and delivery, maintenance activities, field supervision, equipment installation, mail delivery, security, ambulance/rescue/fire, off-road/road repair, chauffeuring guests, and driving to meetings. They can be used only for official business, but they

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may be taken overnight for business trips. The experience gained from this real-life fleet operation at Argonne is documented in the AMFA Program.

On-Site Fueling

Because there are no commercial alternative-fuel stations nearby, Argonne maintains its own refueling stations. The vans are dedicated CNG, the pickups are bi-fuel, and the sedans are flexible-fuel. The sedans can run on either alternative fuel or gasoline; they use alternative fuel 84% of the time. When they are off-site, however, the sedans are refueled with gasoline.

Existing Methanol Facility Continues Operation

Argonne had built a methanol (M85) fueling station in 1989 under DOE's Federal Methanol Fleet Demonstration Program. The Laboratory served as the official cold weather test site for this earlier program, which gathered field data on dedicated methanol vehicles. The methanol refueling facility, now used for the AMFA Program, includes a 10,000-gallon underground storage tank. The tank, pump, and piping are made of special methanol-compatible materials.

The Laboratory also needed an air quality permit from the Illinois Environmental Protection Agency. The Chicago metropolitan area, in which Argonne is located, is designated as a severe non-attainment area for ozone, and volatile organic compound emissions must be minimized. A special nozzle, similar to that required for gasoline, was installed to meet state requirements.

Meeting Environmental Requirements for an Ethanol Refueling Facility

Argonne also built its own ethanol (E85) station. Installation of a 1,000-gallon tank began in October 1992. Ethanol-compatible materials were used for the tank, pump, and piping. The tank could not be filled until the Laboratory received an air quality permit from the Illinois Environmental Protection Agency. Special nozzles, like the ones used for methanol and gasoline were installed, but special vents were also needed because the tank is aboveground. The station met Stage I vapor recovery system requirements and became operational in March 1993. In October 1994, the tank was upgraded to meet Stage II requirements.

Compressed Natural Gas Presents Challenges

The cooperation of Northern Illinois Gas (NIGas), the local utility company, has been a vital factor in setting up Argonne's CNG refueling facilities. The company has loaned various pieces of equipment to the Laboratory, free of charge, in support of the AFVs. NIGas also provides maintenance services for the equipment.

In October 1992, NIGas loaned Argonne a temporary portable quick-fill CNG refueling trailer with a 24-cylinder cascade. By March 1993, the cascade was being exchanged twice a week instead of only once.

In mid-December 1994, NIGas replaced the portable refueling trailer with a self-contained Hurricane CNG compressor and a cascade. Required safety precautions for this new temporary refueling facility included barricades, fire extinguishers, and an emergency shut-off button. Members of Argonne's Technology Engineering Group gave drivers a station overview and safety explanation.

In May 1996, NIGas moved the Hurricane CNG compressor to the Olympics in Atlanta. Two FuelMakers replaced the compressor. These portable gas-powered units compress natural gas and dispense it into fuel tanks. Each self-contained outdoor appliance can fill a 26.4-gallon cylinder to a pressure of 3,000 psig at 68 F within 8 hours. Drivers follow a strict refueling schedule because of the limited fuel supply. It takes about 4 hours to compress enough natural gas to fill one vehicle, and vehicles are allowed only one refueling per week. Argonne has submitted a proposal for a permanent CNG refueling facility to meet current demand and allow for future growth of the CNG fleet.

For more information on Argonne's experience with alternative-fuel vehicles, contact Christine McGhee at christine_mcghee@qmgate.anl.gov.

To learn more about DOE's role in alternative-fuel vehicle research, visit the Alternative Fuels Data Center on the World Wide Web at <http://www.afdc.doe.gov>.

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This table provides information on Argonne's AMFA fleet as of February 1997. The fleet includes 16 Ford Taurus and Chevrolet Lumina ethanol sedans; 17 Dodge Intrepid, Dodge Spirit, Ford Taurus, and Chevrolet Lumina methanol sedans; 21 compressed natural gas Dodge Ram vans, Caravans, and Ford F150 pickups and F250 pickups; 1 Ford F150 propane pickup; and 7 Dodge Intrepid, Ford Taurus, and Chevrolet Lumina gasoline-powered control sedans.

Vehicle	Miles this Month	Cumulative Mileage	Avg. Mileage per Vehicle	Average Trip Length per vehicle	Average MPG (gasoline equiv. gallon)
Ethanol Luminas	460	82,980	27,660	13.6	20.91
Methanol Luminas	349	33,878	11,293	8.4	18.16
Gasoline Lumina	0	12,030	12,030	4.7	13.55
Ethanol Tauruses	2,287	116,934	8,995	6.3	18.12
Gasoline Tauruses	714	25,110	8,370	13.1	20.45
Methanol Intrepids	2,315	27,262	9,087	7.9	21.90
Gasoline Intrepids	1,806	18,764	6,255	6.5	15.29
Methanol Spirits	918	139,988	12,726	6.4	19.05
CNG Caravans	60	26,730	6,683	3.7	8.03
CNG Vans	300	93,280	11,660	4.4	8.31
CNG Pickups	2,491	15,618	1,735	4.1	7.72
Propane Pickup	180	620	620	3.9	10.34